DOCUMENT RESUME

ED 168 517 IR 007 016

AUTHOR Buchinski, Edwin J.
TITLE Initial Considerations for a Nationwide Data Base. Network Planning Paper Number 3, 1978.
SPONS AGENCY Library of Congress, Washington, D.C. Network Development Office.
PUB DATE 78
NOTE 61p.; For related documents, see IR 007 014-017
AVAILABLE FROM Customer Services Section, Cataloging Distribution Service, Library of Congress, Navy Yard Annex, Bldg. 159, Washington, D.C. 20541

EDRS PRICE MF01/PC03 Plus Postage.
DESCRIPTORS *Cataloging; Catalogs; Data Collection; Design; Flow Charts; *Information Networks; Information Processing; *Library Networks; On Line Systems; *Program Planning; Subject Index Terms
IDENTIFIERS *Authority File; *National Library Information Service Network

ABSTRACT

This network planning paper discusses creation and maintenance of authority files as one of the essential components of bibliographic control, which is a prerequisite to the access of information. Authority files impose consistency on the organization of information and thereby greatly facilitate information retrieval. In the creation of a union list of materials, these authority files become the normalizers of entries, making it possible for users to obtain maximum holdings information. This paper includes 19 task considerations for the creation of authority and bibliographic files in relation to background data, network configuration, and authority system design. Topics discussed include the library catalog, its functions, basic problems, and cataloging in a network context; the authority file; the national library network resources and participants; a MARC format for the authority file; and guidelines for cataloging and design considerations for the file.
(Author/MBR)

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ED168517

IR

ISSN 0160-9742

NETWORK PLANNING PAPER

NETWORK DEVELOPMENT OFFICE

NUMBER 3

DATE 1978

TITLE Initial Considerations for a Nationwide Data Base

Prepared by Edwin J. Buchinski

Edited and Revised by Henriette D. Avram and Sally H. McCallum

Library of Congress

Washington

IR007016

Library of Congress Cataloging in Publication Data

Buchinski, Edwin J
Initial considerations for a nationwide data base.

(Network planning paper ; no. 3 ISSN 0160-9742)
Report of a study performed under the direction of the Library of Congress Network Development Office.
Bibliography: p.
1. Authority files (Cataloging) 2. Cataloging, Cooperative--United States. 3. Library information networks--United States. I. Avram, Henriette D. II. McCallum, Sally H. III. United States. Library of Congress. Network Development Office. IV. Title. V. Series.
Z693.B8 025.3 78-12977
ISBN 0-8444-0271-0

Available by request from the Customer Services Section, Cataloging Distribution Service, Library of Congress, Navy Yard Annex, Bldg. 159, Washington, D.C. 20541

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INTRODUCTION

Bibliographic control is a prerequisite to the access of information, and one of the essential components of bibliographic control is the creation and maintenance of authority files. Authority files are the cataloger-created interface between the information with which users approach a file and the information that is supplied by the documents being controlled. Authority files impose a consistency on the organization of information. By ensuring this consistency, the access to information for the user is greatly facilitated. In the creation of a union list of materials, these files become the normalizers of entries making it possible for users to obtain maximum holdings information.

An authority file alone or in conjunction with the bibliographic file is used as a means of validating the form of an established heading, a source of information about related references associated with an established heading, and a benchmark for establishing a new heading that is compatible with the existing file.

The authority file is used to control headings or access points common to many bibliographic records, including personal names, corporate names, conference names, uniform titles, series, topical subjects, and geographic names. Depending on an institution's functions and needs, the kinds of headings under authority control at the institution may vary. An extensive research collection may require control for all of these types of headings while a smaller and simpler collection may need to control only some of these headings.

To date, the role of a central agency such as the Library of Congress in the area of authority control has been primarily as the creator and the disseminator of authority data. The printed lists, Library of Congress Subject Headings and Name Headings with References, have been made available on a subscription basis. The Library also began the distribution of subject authorities in machinereadable form and in microform during the summer of 1976. A project to input name authorities in machine-readable form began early in 1977, and this file is now being distributed by the Library's MARC Distribution Service. This distribution of authority data combined with the widespread use of Library of Congress cataloging has caused the Library of Congress authority lists to be the foundation of authority files maintained by many libraries.

There is a growing realization that the authority file is the foundation or basic building block of the automated library system. There is also a growing awareness of the difficulties involved in the design of such systems where the various files

(authority, bibliographic, and location) share complex intra- and inter- relationships. Although the degree of complexity is magnified by expanding authority control from a single collection to a multi-collection environment, the importance of such a facility is likewise magnified if we build a consistent data base from input emanating from many sources.

Increasingly, attempts are being made to build these multi-institutional systems, usually on a regional basis, in order to share both documents and bibliographic records. As more and more of these systems come into being, it becomes more urgent that the concepts and design specifications for a multi-collection system be developed and that the design incorporate the requirements of a national system.

Background

Many advocate that centralized authority files will solve many of the problems of bibliographic control on both the national and international level. Cursory examination indicates, however, that the design of such a system is very complex and many issues require careful investigation.

There has been limited activity in the implementation of automated authority control systems. Initial developments have been concentrated in those institutions concerned with producing book catalogs, for example, the Washington State Library, New York Public Library, and commercial firms. The importance of rigorous authority control to a machine-based catalog has been documented by S. M. Malinconico in "The Library Catalog in a Computerized Environment."(1) Its role in the creation of book-form catalogs will, without doubt, receive emphasis in the next several years as libraries begin to implement the revised Anglo-American Cataloging Rules, close their card catalogs, and produce book-form catalogs by machine. More recently, however, library systems have been designed to include the use of automated authority files in the cataloging process as well as to produce book-form catalogs.

The Library of Congress Network Development Office originally submitted a proposal to the National Commission on Libraries and Information Science (NCLIS) in July 1976 defining a project to determine the role of authority files in the evolving national network and to establish requirements for and produce an overall design for a national authority system. The scope of the project was such that after several discussions with Commission staff, it was decided that a more effective approach would be first to develop a methodology by which the tasks in the original proposal could be carried out. NCLIS funded this initial work (hereafter referred to as Phase I), and Edwin

Buchinski of the National Library of Canada was asked to perform the study under the administrative and technical direction of the Library of Congress Network Development Office. To assist Mr. Buchinski, an evaluation team was established consisting of individuals familiar with mechanized authority control systems. The members of the evaluation team were Henriette D. Avram, Pamela Andre, Lenore Maruyama, Josephine Puleifer, and Lucia Rather, Library of Congress; Clarice MacDonald, Boeing Computer Services; S. Michael Malinconico, New York Public Libraries; Ruth Tighe, National Commission on Libraries and Information Science; and Suzanne Massonneau, Working Party on Bibliographic Name Authority Files. This group met three times to review drafts of the study. This document represents Mr. Buchinski's final report.

Although it was recognized that most components of the information community, for example, libraries, publishers, and abstracting and indexing services, require some use of authority information, designing an authority system to satisfy the requirements of all of these services is very complicated. To reduce the complexity somewhat, the Phase I work concentrated on library aspects of bibliographic control in the hope that work on the problems of this type of information agency will shed light on the resolution of the problems of other components of the information community, while, at the same time, advancing the development of one highly important component of the "full service network." As work proceeds, recommendations will be made for further studies to solve the problems of the broader community.

During the conduct of Phase I and ensuing deliberations held by the evaluation team, it became increasingly clear that the scope of the study was broader than the consideration of only the authority file and needed to be expanded to include consideration of the bibliographic and location files. Thus, the next phase of the work (Phase II, the carrying out of the tasks isolated in this study) should really address the configuration of the national data base to include authority, bibliographic, and location files.

Shortly after work began on this study, the Network Advisory Group (restructured in April 1977 as the Network Advisory Committee) recommended in its report that several tasks be carried out that would provide an initial blueprint for the development of the library bibliographic component of the National Library and Information Service Network.(2) It had identified these tasks from the results of a study by Lawrence F. Buckland (3), from suggestions by experts in the field of bibliographic control, and from requirements described as urgently needed by other network organizations. A subset of

these tasks was assigned to a network coordinating agency or, in the absence of that agency, an interim agency, namely the Library of Congress Network Development Office. Two from this subset address the authorities question and the configuration of the national data base.

In order to proceed with the design and development of the system configuration of the library bibliographic component of the network, the designers require information on the configuration of the national data base, that is, its logical and physical components, the location of the files, etc. To know these with any certainty, the inter- and intra- relationships of the authority, bibliographic, and location files must be resolved. Thus results of the tasks identified in this report are essential to the detailed design and implementation of an effective and efficient national library network data base, which exhibits a high degree of bibliographic integrity.

A basic requirement for the orderly development of the library bibliographic component and its associated national data base is the inclusion of the Library of Congress authority files. Organizations are looking to the Library of Congress as a major component of the evolving national system, especially in the area of authority control. Therefore, any work performed that leads toward the cooperative building of a machine-readable union catalog must include the Library of Congress authority file requirements and must define the relationship between these requirements and those of the national library network. In addition, the design must address the problems of a system in which decentralized input to a network authority file(s) can be permitted, while simultaneously maintaining high standards of bibliographic control.

Organization

Each section of the report is devoted to a single topic or several subtopics addressing the problems needing investigation and the tasks required to perform the investigations. The report discusses the rationale behind the tasks and the tasks themselves as they were identified during the Phase I effort. The nineteen tasks divide roughly into the following three categories:

Background data - Tasks 1, 2, 7, 8, 9, 10, 11, 12, 18

Network configuration - Tasks 3, 4, 5, 6, 13

Authority system design - Tasks 14, 15, 16, 17, 19

Part of the effort involved in carrying out these tasks will be their integration into a coherent systems development

effort. The report has thus not dealt in interrelating the recommended tasks. In addition, the report does not address many of the economic issues that must eventually be considered in network plans. These initial considerations will take on additional meaning as they begin to relate to the efforts of other groups such as the Network Advisory Committee, Network Technical Architecture Group, the bibliographic utilities, and the service centers. Although it was recognized that in the final analysis, authority, bibliographic, and location files must be considered, the tasks concentrate on authority and bibliographic files.

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Office
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3. The Role of the Library of Congress in the Evolving National Network, a study commissioned by the Library of Congress Network Development Office and funded by the National Commission on Libraries and Information Science, prepared under contract by Lawrence F. Buckland and William L. Saginaki, Inforonics, Inc. (Washington, D.C.: Library of Congress, 1978).

[illegible]

[illegible] of the terms given below have been used in different ways in a variety of definitions. Others are relatively new in the literary community and they are defined here as they are used in this paper. These definitions are provided to enable uniform interpretation of the paper.

Bibliographic search key == A search key made up of a specified number of initial characters from data elements.

Bibliographic service == See Service of responsibility.

Authority file == A set of records that identifies the established or authorized forms for headings. Authority files include cross references from variants to the preferred form of headings, links between earlier and later forms of headings, links that relate headings and narrower subjects, and information concerning the scope of various terms. Authority files provide information that may be used by files of bibliographic records. As a rule, headings within an authority file are consistent and unique within that file.

Authority record == A record of an individual heading in an authority file. It may include variant heading forms, cross references to and from a heading, cataloging notes, explanatory information, and references(s) to the source of a heading.

Bibliographic data == Data that facilitates access to and control of recorded information. Bibliographic data may consist of descriptive cataloging, authority, indexing, and abstracting information.

Bibliographic file == A set of bibliographic records that conform to specific rules or marks.

Bibliographic record == A collection of bibliographic data fields treated as one logical entity that describes a specific title or work.

Bibliographic utility == An organization that maintains large on-line bibliographic data bases, availing it to either a member-based support to any interested users, including national library network participants. A bibliographic utility maintains components of the national library network data store and provides a standard interface through which service centers and individual national library network participants may gain access to the national network.

[illegible] — A set of bibliographic records primarily under control of different [illegible] that describe the contents of a collection, library, or network. It is the catalogue by which bibliographic control is maintained for a collection, library, or network, and by which the relationship between individual bibliographic records can be indicated.

[illegible] in Publication (CIP) — A programme in which the Library of Congress supplies descriptive cataloguing data, based on book galleys, to publishers for inclusion in books when they are published.

[illegible] record — A bibliographic record that describes a specific title or work and also contains data describing its related titles or works described in the catalogue.

[illegible] of completeness — An [illegible] with descriptive completeness for establishing and maintaining the authoritative form of data elements to be used within a network.

[illegible] of special authorization — An organization that has a series of [illegible] that is empowered to authenticate specific data fields in certain bibliographic records. Authentication by these centres of special authorization can be exercised by decisions of a series of [illegible].

[illegible] Designation — The means by which data is designated [illegible] to a [illegible] meaning.

[illegible] reference entry — An entry that directs a user from a particular form of a heading to the authoritative form ("see" references) or from one authoritative form to another because they are related ("see also" references).

[illegible] — The form of a name, subject, uniform title, series, etc., used as an access point in a bibliographic or authority record. The totality of headings in an authority file is indicative of the organization of an entire catalog and the rules used to structure it.

[illegible] Library network data base — A computerized set of machine-readable files of bibliographic data contributing to network processes and developed to support national library network activities. Throughout this report, the national library network data base is referred to as the network data base.

[illegible] Library network data entry — The conversion to machine-readable files of bibliographic data processed by the

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national library network's participants. Although a group of records from one source may exhibit attributes of consistency, coherence, and nonredundancy, these attributes are not essential file characteristics. The records should, however, all conform to broad national standards such as ANSI Z39.2-1971 (the format for the representation of bibliographic information on magnetic tape;. As these records are transferred to national library network data base status, it is expected that some normalization to network standards will occur. Throughout this report, the national library network data store is referred to as the data store.

National library network union catalog -- A union catalog or set of union catalogs (separate union catalogs may be necessary for specific library groups) derived from the national library network data base. Entry points will be standardized by centers of responsibility and record redundancy will be minimized. These union catalogs may contain only summary location data that point to appropriate regional files for detailed holdings information. Throughout this report, the national library network union catalog is referred to as the network union catalog.

Network coordinating agency -- An agency responsible for coordinating the development of the library component of the national library and information service network. More specifically at this time, it is responsible for the coordination of tasks outlined by the Network Advisory Group as necessary for the network. The Library of Congress Network Development Office serves as an interim coordinating agency.

Normalized search key -- A search key constructed by dropping punctuation and accent marks, converting to upper case, dropping multiple blanks, and appending a hash total. It bears no logical relationship to the filing form of the heading.

Quadraplanar structure -- A form of data representation in which bibliographic data and locations data collected from more than one institution are organized with minimal duplication of data elements by distinguishing four levels or types of data planes: universal or system, multi-institution or collection, single institution, and copy. Data elements from a record that are alike for all institutions in the system belong to the universal plane, those common only to subsets of institutions are on the multi-institution planes, and likewise for the other levels. The concept was developed at the University of Chicago.

Series -- A number of separate works issued in succession and related to one another by the fact that each bears a collective title. They are normally issued by the same publisher in a uniform style, frequently in a numerical sequence.

Service center -- An organization that serves as a broker or distributor of computer-based bibliographic services. A service center gains access to national library network resources through the facilities of a bibliographic utility.

Subject subdivision -- A term that is used to subdivide a subject heading into smaller components, generally used with voluminous subjects.

Topical subject -- A subject heading consisting of a general term such as "education" or scientific and technical terms, as opposed to a name.

Uniform title -- The particular title by which a work that has appeared under varying titles is to be identified for cataloging purposes (a conventional or filing title); also refers to titles created for anonymous works, radio and television programs, motion pictures, composite manuscripts or manuscript groups, or treaties and intergovernmental agreements.

Union catalog -- A catalog that describes the contents of physically separate library collections, indicating by means of locations data the libraries in which a given item may be found.

Validation -- A machine or manual process in which the data and the content designators of a record are matched against standards and notification is given of any errors or inconsistencies detected. Not only is the record itself checked (verification) but it is also checked against existing files. No data are changed during validation.

Verification -- A process in which a record is proofread to determine whether it is complete and error free.

I. THE LIBRARY CATALOG

Objectives or Functions of a Catalog

The library catalog displays and organizes a library's holdings. There is still much validity to the description of the basic functions of the catalog given by Cutter in his Rules for a Dictionary Catalog and substantially reiterated by the Statement of Principles adopted at the International Conference on Cataloging Principles, Paris, October 1961. The basic functions of a catalog are:

> "1) to facilitate the location of a particular publication as specified by:
>
> a) its author and title, or
>
> b) if the author is not named in the book, its title alone, or
>
> c) if author and title are inappropriate or insufficient for identification, a suitable substitute for the title.
>
> "2) to relate and display together the
>
> a) works of a particular author
>
> b) editions of a particular work
>
> c) works on a particular subject" (1)

Among the methods employed to realize these objectives is the formation of entry points according to standard rules. Since a work is normally identified and cited by author and title, the Anglo-American Cataloging Rules (AACR) specify that a work be entered under its author and title in the library catalog. Complications arise since the names of authors and the titles of works are not constant. An author's name may appear in different forms in various works and even in different editions of the same work, and a work may appear in its various editions under different titles. To resolve these difficulties the AACR incorporated Lubetzky's recommendation from his Code of Cataloging Rules to regard a publication

> "as one of the editions of a certain work by a certain author, to be identified by and represented in the catalog under a particular title and a particular name--with added entries or references used to facilitate the location of the editions issued under other titles and the works issued under other names of the author." (2)

Basic Problems to Be Resolved in Cataloging

Descriptive cataloging:

Descriptive cataloging is the process of recording the identifying features of a work in order to distinguish it from and show its relationship to other works. Consistency in this recording process is provided by the use of a cataloging code, a set of rules that give instructions to help the catalogers resolve, among others, the following problems:

a) Who is to be regarded as author of a work?

b) By which name or form of name is the author to be identified in the catalog if the author has used or has had more than one name or more than one form of name?

c) Under which of its parts is a name to be entered in the catalog when, for example, it includes a compound surname or a surname with a prefix or when it is a corporate name composed of hierarchically organized parts?

d) How is a name to be distinguished from similar names of other persons in the catalog?

e) By which title should a work be identified in the catalog if issued under more than one title?

Subject cataloging:

Thesauri or subject lists differ from cataloging codes in that they prescribe a list of terms to be used in defining the subject of the work rather than give instructions for choosing, forming, and recording identifying data. The cataloger selects the most appropriate terms, assisted by scope notes in the thesaurus or subject authority file and knowledge of the particular subject. Instructions concerning the qualification of topical headings, by geographic, chronological, or form headings must frequently be interpreted. A descriptor or subject heading may need to be supplied by the cataloger when the subject term authority lacks a particular term needed to describe a work. Subject catalogers also usually follow the provisions of a cataloging code when creating headings for personal names, corporate names, and titles of works that are the subject of the item being cataloged.

Classification schemes, like subject headings, provide a means of relating works on a particular subject. They also

provide a means of arranging items on a library shelf. Revisions and updates to schedules such as the Library of Congress classification schedules and the Dewey Decimal classification occur on a fairly regular basis. If library catalogs were to be updated to conform with revisions to the schedules, such a policy would require relabelling the items themselves in addition to updating the catalog. Such a procedure would impose a very large financial burden on the institution while providing little or no benefits to the catalog user; therefore, libraries as a rule do not adjust their collections to conform with revisions to classification schedules. This report does not treat this type of subject access in detail since it is not a major consideration for the design of a national authority control system.

Cataloging in a Network Context

Catalog records contributed by individual libraries and consortia to a central union catalog would likely comprise records created according to a number of diverse rules and standards as well as variant interpretations of particular cataloging codes. The difficulties encountered in assembling these records into a single union catalog correspond directly to the difficulties of rationalizing or accommodating the multiple rules and standards themselves into a single code.

The Paris Statement of Principles has served as the basis of many national cataloging codes. The principles "apply only to the choice and form of entry of headings and entry words ... in catalogs of printed books in which entries under authors' names and, where these are inappropriate or insufficient, under the titles of works are combined in one alphabetical sequence."(3) Since these principles were drafted for the benefit of general libraries, some smaller libraries and specialized collections may decide not to follow all of these principles or to ignore them entirely. In the network context, this lack of adherence to a uniform standard will compromise the ability to identify records for the same items when the individual library records are assembled into a single union catalog. The same situation exists with respect to subject entries, as has been noted by Martin:

> "Libraries with in-depth collections in narrow subject areas are unlikely to adhere to the 'conventional' standards such as LC subject headings or Dewey Decimal classification. Out of necessity, these libraries have adopted special subject-oriented methods of storing and describing their collections. Some of these methods are employed by many libraries within a subject area, such as the Harvard Yen-Ching classification system for Oriental collections. In most cases, however, the individual library has

created its own approach. If such libraries join library networks, their cataloging and classification practices may have to be accommodated. The subject headings used by special collections are non-standard for legitimate reasons, but incorporation of a variety of practices into a single system requires careful planning to allow efficient and economical use of the system."(4)

Thus, while the basic principles for cataloging construction might be widely accepted in libraries in the United States, they may fall into separate groupings based on common needs and practices. According to Martin:

> "In 1976, most of the formal cooperation among libraries in the United States was occurring on a type-of-library basis. Consortia could be described as academic library consortia or public library consortia, for instance. Some cooperation between different categories was occurring in the larger regional computer-assisted networks such as NELINET or SOLINET, but a cursory glance at existing cooperative structures shows that libraries tend to associate with similar libraries."(5).

Since some libraries will be working cooperatively on the basis of library type, they will probably want different services from a national bibliographic system. A study should be undertaken to determine the number of discrete types of libraries that may actually exist, the authority requirements that are unique to each type of library, and the service implications that these requirements have for a national authority control system.

TASK 1

> A study should be made to determine the number of discrete library rules and standards in use in libraries in the United States and the extent to which these rules and standards have to be accommodated in the national library network authority file(s) and system(s).

A questionnaire should be devised to gather information concerning the cataloging codes and practices, subject headings, and classification schemes that are being used by library groups such as the medical libraries or agricultural libraries. Library associations can serve as a source for selecting a number of institutions deemed representative. An attempt should also be made to determine each institution's reasons for following a specific [illegible] such as AACR, Library of Congress Subject

Headings (LCSH), and Medical Subject Headings (MESH). Results should be analyzed to determine the number of discrete variances that will need to be supported in the national library network. Similar work performed by the Research Libraries Group may provide useful additional information.

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1. International Conference on Cataloging Principles, Paris, 1961, Statement of Principles, annotated ed., with commentary and examples by Eva Verona assisted by Franz Georg Kaltwasser, P.R. Leveis, Roger Perriot (London: IFLA Committee on Cataloguing, 1971), p. xiii.

2. Seymour Lubetzky, Code of Cataloging Rules: Author and Title Entry, an unfinished draft for a new edition of the cataloging rules prepared for the Catalog Code Revision Committee, with an explanatory commentary by Paul Dunkin (Chicago: American Library Association, 1960), p. xi.

3. International Conference on Cataloging Principles, Paris, 1961, Statement of Principles, p. xiii.

4. Susan Martin, Library Networks, 1976-77 (White Plains, N.Y.: Knowledge Industry Publications, 1976), p. 76.

5. Ibid., p. 73.

II. THE AUTHORITY FILE

The primary purpose of an authority file is to accomplish the collocation function of the catalog, that is, to enable the catalog to relate and display together works by the same author, on the same subject, and in various editions. A record of the preferred form of the name, title, or subject term under which works will be listed is retained in the authority file. In addition to recording the various forms of names that have been established in the catalog along with their related references, the authority file may also contain citations to the bibliographic sources and source information used in determining the form of a heading or its references, history notes, and other information useful in identifying or applying the heading.

The form of the heading selected as the preferred or established form in a given library catalog is determined by the interplay of one or more of the following factors:

1) the cataloging rules and guidelines used to formulate the form of the heading,

2) the publication being cataloged for which the heading is first established,

3) the reference sources available to the individual who establishes the particular heading,

4) the existing file of established headings into which the new heading is incorporated,

5) the individual who interprets the rules.

These determinants of the forms that are selected for headings can be controlled fairly satisfactorily in a given library since the catalogers creating the headings are in a single physical location. It is generally accepted, however, that effective control of a catalog is directly related to its size. It follows that building a network union catalog in a cooperative mode will pose great problems because the individuals creating and using the headings will be geographically dispersed and the union catalog will be larger than any single library catalog. Some of the problems relating to file size in a network context are discussed in section VI of this paper.

According to Rather, headings recorded in an authority file support one or more of the following uses:

"1) a means of verifying the form of an 'established heading,'

"2) a source of information about see and see also references associated with an 'established heading,'

"3) a benchmark for establishing a new heading which is compatible with the existing file."(1)

These applications of the authority file help ensure that the library catalog has an orderly and systematic arrangement and that the functions of the catalog are fulfilled.

It is expected that individual libraries would make similar use of an authority record service emanating from a central source. It is difficult to assess these uses of a name authority service because there has been no bibliographic service devoted solely to the distribution of name authority records. Before 1974, many libraries relied on the National Union Catalog published by the Library of Congress as the chief source of name authority information. Since then the Library of Congress has started distributing name authority records in the publication Name Headings with References. While editions of Library of Congress Subject Headings have been published since 1924, during the latter half of 1976 it was expanded to include headings for subjects that had previously been excluded from the printed version. In addition to expanding coverage, microform and machine-readable versions were made available as alternatives to the traditional printed form. Data on the use of these services, in the various distribution formats, by individual libraries should be gathered to assist in the design of the network authority file. The extent of use of the National Union Catalog and the Library of Congress Subject Catalog should also be determined.

TASK 2

A study should be made to determine the use of authority files by individual institutions and the sources from which these files are derived. In particular, the study should determine the uses that individual libraries make of Name Headings with References and of Library of Congress Subject Headings, in its various formats, and the strengths and weaknesses of each service and its format(s). The use of the National Union Catalog and the Subject Catalog as a source of authority information should also be determined.

A questionnaire should be devised and sent to samples of subscribers to Library of Congress Subject Headings and Name Headings with References to determine how libraries use these services for verifying, cross-referencing, establishing new

headings, and maintaining their authority files. Experience-perceived strengths and weaknesses of these services in the machine-readable, hard copy, and microform formats should be elicited. The survey should also include institutions and networks which have not used these services to date in order to determine their practices with respect to establishing authority files. The questionnaire should be designed to obtain information on the use that is made of the National Union Catalog and the Subject Catalog as a source of authority information. The survey should include representatives from library groups that are devoted to special subjects or user populations, such as the agricultural, medical, research, public, and academic library communities. The institutions may be surveyed by mail and telephone, with a small number being visited for in-depth interviews.

REFERENCE

1. John Carson Rather, "Thoughts About a National Name Authority File," working paper presented to the Working Party on Bibliographic Name Authority Files, 1976.

III. NATIONAL LIBRARY NETWORK PARTICIPANTS

The national library network cannot be defined independently of the bibliographic products and services currently being provided by the various libraries and library service organizations. A national library network will become a reality once these libraries and bibliographic organizations have been brought together by a sophisticated system of communications that enables its members to create, utilize, and disseminate products according to well-defined network standards. A project to create the physical linking capability has been begun by the Network Technical Architecture Group, a group created for that purpose by the Network Advisory Group.

It is thus important to begin to define the components of the national library network and to identify the functions of components in order to create a framework for examining the problem of authorities which should play a large role in the logical linking of the various services. Although recognizing that consensus on the issue is difficult to obtain, for the purposes of this study the network components will be deemed to consist of: a) a network coordinating agency, b) bibliographic utilities, c) service centers, and d) libraries. There is acknowledgment among members of the Network Advisory Group (2) and other network planning groups (3) that the national library network environment may be roughly divided into these components, whose names indicate the functions that each component would perform within the network. Individual institutions or consortia may also fulfill more than one group of functions and therefore represent more than one component within the network.

Network Coordinating Agency

The Network Advisory Group recognized the need for a network coordinating agency and requested that the Library of Congress Network Development Office serve in that capacity in the interim. It assigned to the network coordinating agency coordination responsibilities for four tasks, one of which is to determine the role of authority files in a nationwide network. The other three tasks will influence the definition of that role, therefore decisions made in the other areas must be monitored as work proceeds.

TASK 3

> The tasks ascribed by the Network Advisory Group to a network coordinating agency, namely, 1) design the technical network configuration, 2) determine the legal and organizational structure of the library bibliographic component, and 3) specify the

configuration of the national data base(s), should be analyzed for their implications for the design of the national library network authority file.

In addition to the functions described above, the network coordinating agency should be expected to assume responsibilities directly associated with the network union catalog and the national library network authority file. The following functions were recommended by the Phase I evaluation team as additional responsibilities of the network coordinating agency: 1) maintain network files, 2) monitor the authentication and validation of contributed records, 3) provide access to network files, and 4) in cooperation with the U.S. library community, maintain the codes and standards developed for the network.

The Network Advisory Group also defined eight tasks that the Library of Congress operational units should perform as a network node.(6) These include such activities as designing and implementing the hardware configuration it will need to operate as a node, making available appropriate Library of Congress data bases, determining a pricing structure for its products and services, designing and implementing remote entry systems, and making international MARC records available through the network. Most pertinent to this report, this list of tasks also includes designing and implementing an on-line authority file and a retrieval or query system to provide on-line access to bibliographic, authority, and holdings records. The design of this on-line authority file should be coordinated with the tasks and functions assigned by the Network Advisory Group to the Library of Congress Network Development Office as the interim network coordinating agency for the national library network.

Bibliographic Utilities

In the context of this report, a bibliographic utility is a facility serving a subset of the national library network's participants. It would maintain: 1) components of the national library network data store, 2) ensure network standards, and 3) provide a standard interface to the network. Standard interfaces includes both communications protocol and bibliographic codes; for example, a bibliographic utility should provide the translation vehicle between network standard bibliographic practices and local practices.

Bibliographic utilities could provide mechanical links between local variants of bibliographic records and their authoritative analogs in the network union catalog. If a bibliographic utility maintained its participants' authority files, data could be validated by the utility before they are submitted to the network union catalog. This would also provide

a change already changes made to the network union catalog could be communicated to local catalogs. The linking of these authority file levels would assist in the translation of local records to the corresponding records in the network union catalog.

Bibliographic utilities could maintain the detailed physical locations of materials so that holdings data of the network union catalog might be referenced to utilities. The utilities named would then provide a more specific location.

Service Centers

A service center is defined here as a facility that provides products or services to a subset of the national library network's participants. It would utilize the facilities of one or more bibliographic utilities in order to gain access to the national library network's resources.

A service center could be concerned with synthesizing products and services from the resources available to the national network, for example, producing book catalogs or card sets from the data obtained from one or more utilities, maintaining the interlibrary loan facilities within a region, and directing interlibrary loan requests to other regions via the facilities of bibliographic utilities. A service center would also be responsible for contractual arrangements and the training required for its membership.

The major difference between a service center and a bibliographic utility would be that a service center would not contribute directly to the national library network data base since the machine-readable records its members produce would be input to the bibliographic utility facility. While the ultimate responsibility for ensuring conformity to network standards must fall on utilities working in concert with the network coordinating agency, additional responsibility for bibliographic standards may be assumed by the service centers.

Libraries

The library component consists of various groupings of libraries, such as medical libraries, law libraries, public libraries, research libraries, and academic libraries. Each of these groups could make special demands on the network authority system. Clientele of individual library's should be able to access the network resources with descriptors employed by groups of libraries other than those used by the library that the particular library patron is using. A physician, for example, should be able to query the network resources using terms from

the National Archives Gazetteer records a reference number as the nearby branch of the public library.

References

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2. Ibid.

3. "Library Automation in the Back: the Open Access Issue," a working paper examining policy and issues in which patrons library organizations are connected to Online interactive retrieval services, Fifth Draft (Boulder: National Information Committee for Higher Education, September 15, 1976).

4. Library of Congress Network Advisory Group, "Report on Personal Library and Information Service Needs: The Library Bibliographic Component," pp. 23-25.

IV. NATIONAL LIBRARY NETWORK RESOURCES

Three useful categories of bibliographic resources may be conceptualized given the national library network participants outlined in the previous section: a) local library catalog records not represented in machine-readable form, b) the national library network data store, and c) the national library network data base which includes the national library network union catalog(s). Each resource will represent a different level of conformity with network standards and therefore interact in a specific way with the national library network authority file. While it will be convenient to refer to these resources as single entities in the following discussion, the actual configuration of each resource remains to be studied. The problems of centralization and decentralization and of the distribution of data elements are the concern of several tasks recommended in this report.

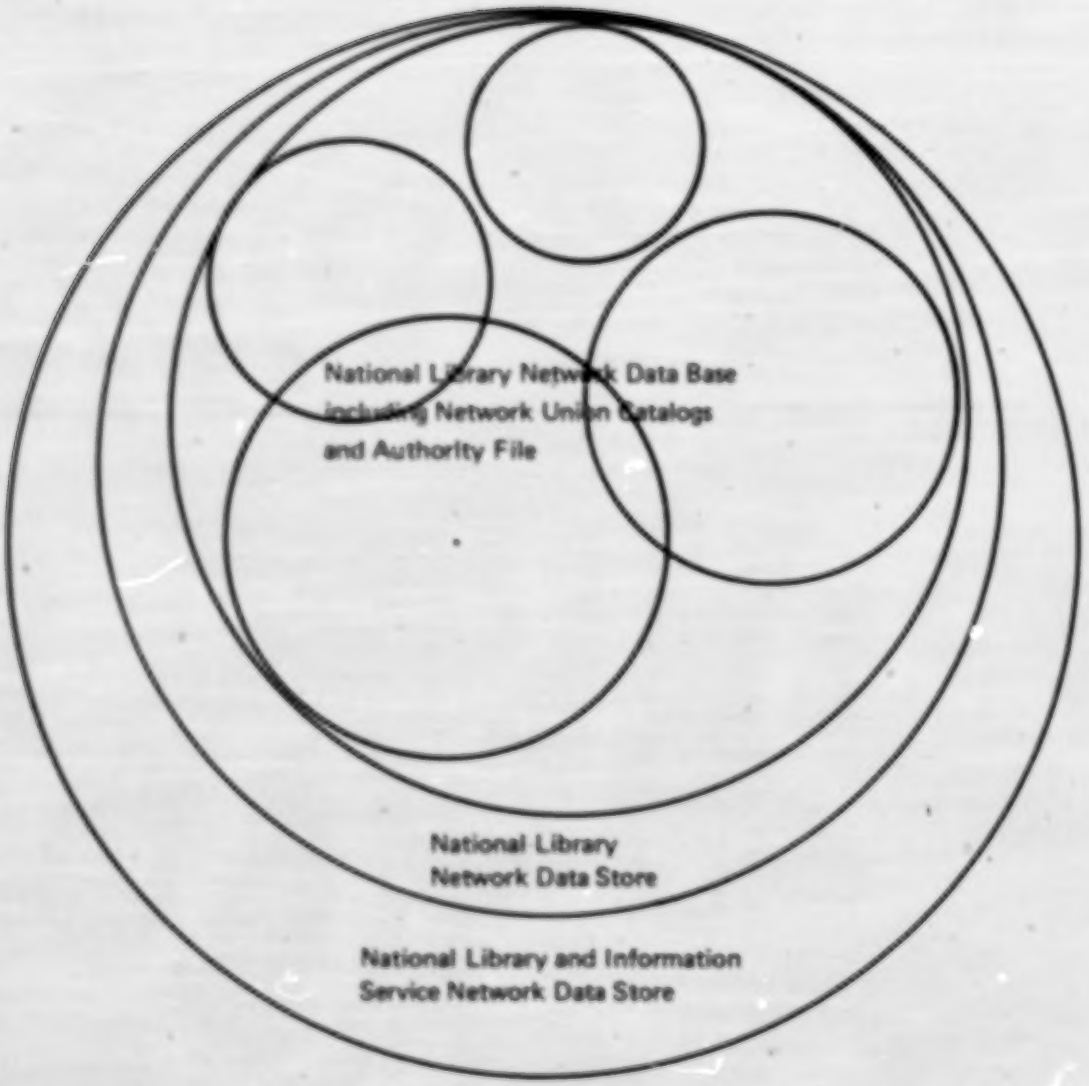
National Library Network Data Store

The national library network data store is the aggregate of machine-readable files of bibliographic data possessed by the network's participants. Although particular collections of records from any one source may exhibit consistency and nonredundancy, these attributes are not essential file characteristics.

The data store is only one component of the larger national library and information service network data store (see Figure 1), since the former only contains records produced by the library sector of the information community, thereby excluding the records produced by groups such as the abstracting and indexing agencies. The data store provides the raw data from which the network data base is built. It should be more comprehensive than the network data base since it should contain unmodified records produced outside of the United States.

The data store records should conform to broad national standards such as the format for the representation of bibliographic information on magnetic tape (ANSI Z39.2-1971). The individual institutions creating the records might exercise considerable latitude in implementing accepted standards or guidelines. It is expected that the network coordinating agency, in conjunction with centers of responsibility and bibliographic utilities, would normalize the records according to the network standards as they are transferred from data store file status to the network data base file status. The requirements with respect to conformance to standards and validation procedures would be progressively greater as a record passed from the data store to

Figure 1


National Library Network Data Base
including Network Union Catalogs
and Authority File
National Library
Network Data Store
National Library and Information
Service Network Data Store

the network data base and then finally became fully integrated into the network union catalog. The processing might also consist of different mixes of mechanical and manual intervention.

International records would require special processing to ensure that they could be accessed by and communicated to members of the network. The content of the data store would be expanded as international programs of record exchange such as those envisaged under Universal Bibliographic Control are implemented.(1) International adoption of UNIMARC, the proposed international MARC format, would minimize the effort required to normalize records from international sources to the national format.

An authority system can be devised to link headings used in records in the network data store with headings that are created according to network standards. While no attempt should be made to provide links to all headings in the data store, it would be useful to determine which categories of headings can be expected to appear frequently enough in records transferred from the data store to the network data base to justify their incorporation as related forms into the network authority file.

TASK 4

> A study should be made of the methods by which the national library network could provide access to the records that comprise the national library network data store and of methods for selecting records from the data store to be upgraded to network data base status. The categories of headings in records in this file that might usefully be incorporated into the national library network authority file should be determined. The economics of building the indexes to access the data store and of transferring records from the data store to the network data base should be considered.

To accomplish this task it is necessary to develop methods to access these records and to explore methods for identifying records potentially of high utility to the network participants. The coverage and details concerning standards and formats of records in the data store may be determined by studying documentation provided by the agencies creating the respective MARC records. Individual headings, as well as the standards by which they are produced, should be examined to assess the potential utility of these headings. Results of the analyses conducted in Task 10 and Task 11 should also be reviewed.

Access points of the greatest potential use to the network participants should be identified and their characteristics analyzed. These results should be considered in conjunction with the access points established for the network union catalog. A common access mechanism should be devised to access records in both the network union catalog and the network data store, if possible.

The analysis of characteristics of non-Library of Congress records contributed to the National Union Catalog, Task 7, should provide valuable data for this study and shed light on the possibilities of identifying records in the data store that are potentially of high utility to the network participants. If characteristics of potentially useful records can be determined, then an attempt should be made to develop an algorithm for selecting these records from the data store.

Analytical techniques should be used to determine the economics of converting records to the network data base standards using several possible alternative methods, for example, format recognition, format recognition with automated authority file interface, or human editing. The technique to be employed may be dependent on the source of the record.

National Library Network Data Base

The national library network data base would be a consistent, logically nonredundant set of data files constructed according to network standards and designed to support the network services.

It will consist of the authenticated records that are a subset of the network data store and associated indexes to these records. The network data base will be composed of logical subsets which include the national library network union catalog(s) and the authority files developed to maintain the integrity of the network data base. In-process data such as Cataloging in Publication (CIP) descriptive cataloging and authority data that is transient in nature(2) will also form part of the network data base.

Consideration should be given to structuring the network data base according to the data base concept developed at the University of Chicago called the "quadraplanar data structure."(3) This concept of file organization has since been elaborated on and implemented by the Washington Library Network. It enables network members certain freedoms to select and specify local catalog organizational elements while simultaneously imposing a large degree of uniformity on network data.(4)

The quadraplanar data structure should be examined carefully because it differs from the traditional concept of organization of bibliographic records. This data base management-oriented concept of "record" has implications for the location of various types of data elements within a network. The Washington Library Network data base design suggests that institution specific and copy specific information should be maintained at a relatively local level. It also could have implications for the division of responsibilities among the component members of the network and, in particular, the interrelationships among centers of responsibility.

TASK 5

> The quadraplanar data structure, developed at the University of Chicago and implemented by the Washington Library Network, should be carefully evaluated as a data base design model for a centralized or a distributed national library network data base.

Models should be developed of the network data base organized according to quadraplanar data structure. A simulation of the quadraplanar data structure in a network data base environment should be undertaken to determine its effect on system performance, especially as the number of authority systems that must be supported increases. These results should be analyzed to determine how the network data base can be distributed. The model should also be used to test whether the national library network should consist of all libraries linked into a single system or whether each library group, such as the agricultural, medical, public, and research libraries, should have its own separate network.

National Library Network Union Catalog

The national library network union catalog would be a standardized catalog of the titles submitted by the network participants. It is possible that the network will require more than one union catalog, with each union catalog being specific to a distinct library group; however, all of these individual union catalogs would still be part of the network data base, and record redundancy among them would be minimized by the data structure employed. The network data base would have headings normalized according to more than one standard, for example, Library of Congress Subject Headings and Medical Subject Headings, while each network union catalog would follow only one standard for each type of heading as is currently being done in the National Union Catalog.

Each network union catalog would have designated centers of responsibility that would control particular systems of headings and assist participants in uniform interpretation of the network standards. It is assumed that these centers would authenticate headings with respect to the network authority file rather than on the basis of their particular collections, since the records in the union catalog would include titles that are not part of the center's collection. The concept of a center of special authorization might be utilized to control special data elements. Centers of excellence which provide authoritative records in special areas may combine that role with authentication responsibilities.

The maintenance of consistency and file integrity in the union catalogs could be assisted by automated authority controls capable of performing various types of checking routines such as those developed by the New York Public Library.(5) Additional features to permit linking the authority files of the different library groups and to support an international interface might be provided through an authority system facility similar to that of the National Library of Canada.(6, 7)

The network union catalog data could be stored in a decentralized mode, yet appear centralized to each user accessing the network resource through a telecommunications facility with adequate message-switching capability. Decentralization would require sophisticated facilities to ensure consistency of the aggregate network union catalog. With a distributed data base design, extensive data redundancy checks would be necessary. There would be trade-offs in communication costs, storage costs, and software and hardware requirements between a distributed data base design and a centralized data base design.

TASK 6

> Determine the trade-offs in communications costs, storage costs, accessibility to data, software and hardware requirements, etc., implied by a distributed data base design versus a centralized data base design for the national library network union catalog.

Commercially available facilities should be used to determine the communications cost trade-offs that are implied by the central versus the distributed configuration. Storage costs, accessibility to data, and software considerations should be explored on a theoretical basis, and narratives with some estimate of costs, as appropriate, should be developed.

Input to the network union catalog would be decentralized. Records might be contributed in an on-line mode with appropriate

review, or they might be contributed on magnetic tape and reviewed in a manner similar to that of the COMARC project.(8) Machine-readable records would include non-Library of Congress cataloging. Some accession reports would probably continue to be made on cards as are in current reporting to the National Union Catalog. Reasonable estimates should be made of the relative number of accessions to be reported to the network union catalog via on-line communication, magnetic tape, and hard copy. Analyses would be needed of the work required to incorporate hard copy contributions and of the agencies that should carry out this task. The implications that the volume of reports contributed and the mode of submittal could have on the network authority file system design should be considered.

TASK 7

> A study should be made of the efforts currently being exerted to integrate reports into the National Union Catalog to determine how these can be facilitated by an automated authority control system. The number of reports currently contributed should be used to project the number of potential reports to the national library network union catalog.

An appropriate random sampling technique should be devised to project the volume of reports, language and country of publication of the items reported, and mode of reporting (for example, on-line or magnetic tape). The National Union Catalog, Register of Additional Locations, and COMARC reports should be analyzed for 1) the completeness of the records, 2) coverage, and 3) related difficulties which might be encountered in future network reporting. Analyses already performed on COMARC data during the COMARC Pilot Project should be used as input to this task as well as any findings reported in the Butler study.(9)

Reports to the National Union Catalog that lack Library of Congress catalog copy should be examined for the distribution of imprint dates. National Union Catalog reports and previous editions of the National Union Catalog may be analyzed to determine the chronological distribution of the creation of cataloging data by reporting libraries and the Library of Congress and the differences in the cataloging data when the Library of Congress copy replaces the contributed copy.

The files maintained by the Catalog Publication Division of the Processing Department at the Library of Congress could be analyzed to determine the kinds of editing that are presently carried out on reports to the National Union Catalog. Staff interviews should be conducted and the professional literature should be consulted to determine the difficulties that are

encountered in editing reports and the possibilities for utilizing the future network authority file to assist in this work. The tasks involved in the validation process should be documented and used as the basis for determining whether the tasks could be distributed through the nodes of the network.

Local Library Catalog Records Not in Machine-Readable Form

A study should be made to determine whether only prospective cataloging should be reported to the network union catalog and to assess the effect that this policy might have on the network data base design and on plans for retrospective conversion of existing local library catalogs.

TASK 8

> Determine the consequences from the lack of both bibliographic records and location data of representing only prospective cataloging in the national library network union catalog, and assess the effect that such a policy might have on the national library network data base design and on plans for retrospective conversion of existing library catalogs.

The libraries surveyed about the use of an authority file, Task 2, should also be asked about their plans for converting and closing their catalogs. The results of the survey should be analyzed to determine: a) the potential difficulties in adding retrospective cataloging data, the negative effects and difficulties of incorporating headings established according to earlier cataloging codes, and the potential of the automated authority system to assist libraries in adjusting headings created according to older standards to those employed in the network union catalog; and b) the potential disadvantages of not including retrospective cataloging, the negative effect of the lack of bibliographic data to which location data for older materials can be assigned, and the negative effects on public service and other library functions.

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V. AUTHORITIES: A MARC FORMAT

Authorities: A MARC Format has been issued in a preliminary edition.(1) While it was intended to provide the structure for all types of authorities, that is, names, subjects, and series, the portion applicable to series authority records has yet to be fully defined.

A crucial question in the extension of the authority format to series is whether series authority information is more adequately conveyed through a bibliographic record that describes the series as a serial open entry or whether the record for the series should conform with the authority record structure. If the latter option is followed, the series authority format would need to accommodate information on frequency, source, library classification practice, etc.--fields typically associated with bibliographic records. Alternatively, if series authority control data is to be communicated through the bibliographic record for a series, then new codes and subfields may have to be added to provide status information in each field of the bibliographic record--codes and subfields typically associated with authority records.

TASK 9

> Further work must be undertaken by the Library of Congress to accommodate series in either the bibliographic format or the authorities format.

The Library of Congress staff needs to complete the analysis of series authority record requirements and to determine if these should be incorporated into the authorities or the serials formats.

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VI. THE NATIONAL LIBRARY NETWORK AUTHORITY FILE

The nature, content, and structure of the national library network authority file will be influenced by the characteristics of the emerging national library network. It is assumed that the factors which determine the form of a heading that is selected to be the established form in an individual library catalog are also valid in a national network context. The ability to control these factors will significantly influence the contents of the network authority file. The types of access that individual institutions have to this file will influence the ease with which these factors are controlled and the effort required to incorporate individual records into the network union catalog. These factors that determine the form of a heading are considered within the network context in the following paragraphs.

Cataloging Rules and Guidelines Used to Form Headings

The particular set of rules used in establishing each network authority heading should be explicitly identified in the authority record to facilitate machine manipulation of the authority file. As the number of cataloging codes and subject heading schemes to be supported by the network increases, it will become progressively more difficult to differentiate each set and to codify its relationship with another set. For this reason, the number of standards used in the network ought to be kept to the essential minimum.

Descriptive cataloging:

It is expected that the second edition of the Anglo-American Cataloguing Rules (AACR 2) will be published in 1978 and that it will be adopted in Australia, Canada, Great Britain, and the United States in 1980. Representatives from the Library of Congress and each of the other countries met on November 8-9, 1976, and discussed implementation strategies for the new code.(1) Two of the objectives of these meetings were to identify possible differences in the application of AACR 2 by these libraries and to work out ways to minimize the differences so that the interchange and effective use of MARC records produced by these libraries could be facilitated. As an initial project in this effort, the Library of Congress has undertaken an analysis of a sample of Australian, British, and Canadian MARC records for works that the Library of Congress has recently cataloged, comparing them with the entries in the Australian National Bibliography, the British National Bibliography, and Canadiana to determine: 1) differences in choice of main entry headings; 2) differences in total name access points; and 3) differences in forms of headings for personal names, corporate names, and uniform titles.

An attempt will be made to assess why differences exist and whether these differences will continue under AACR 2. A determination will be made of the effect upon the Library of Congress catalogs of accepting headings established according to AACR 2 rule options not selected by the Library of Congress. It is expected that the national libraries of Australia, Canada, and Great Britain will undertake similar studies.

Various divisions of the American Library Association and the library organizations in Canada and Great Britain reviewed the new code in the spring of 1977 to determine whether the objectives set forth for the code revision had been met. Considerable information will likely be generated before the implementation of AACR 2 in 1980 as library associations and individual libraries investigate the impact of the new code on individual library catalogs and its implications for authority files. The results of studies made by the Library of Congress and the national libraries of Australia, Canada, and Great Britain concerning cooperative implementation of AACR 2 should be available soon and will provide considerable insight on the prospects of developing guidelines for interpreting AACR 2 as an instrument for the creation of headings that can be used without conflict in a cooperative network.

TASK 10

> Differences in the application, interpretation, etc., of AACR 2 should be analyzed to determine which problems can be eliminated by common agreements on rule interpretation, uniform choice of AACR 2 rule options, and authority file and system override of variant headings. The results of this analysis should be used in the design of the national library network data base.

Subject analysis:

While there are well-defined codes of principles to assist librarians in establishing name, uniform title, and series headings, there is no similar code for subject headings. The principles developed by Haykin (3) provided the basic guidelines in the evolution of the Library of Congress subject headings which have become an authority file for establishing subject headings. The introduction to the eighth edition of Library of Congress Subject Headings indicates that the Library of Congress is working on a more comprehensive usage guide that will make it feasible in the future to produce a less exhaustive listing of headings by providing more specific guidelines for the creation of subject headings.

An agreement concluded recently between the Library of Congress and the National Library of Canada (3) should lead to the further development of Library of Congress subject headings and the exploration of difficulties of creating and using them in a network context. Under this agreement, all new national subject headings created by the National Library of Canada that are not specifically related to the Canadian cultural and historical context will be submitted to the Library of Congress for possible incorporation in Library of Congress Subject Headings. Elements identifiers will be used to indicate Library of Congress and non-Library of Congress headings, and guidelines will be developed for differentiating these categories. This project should provide valuable information regarding difficulties that may be encountered and principles and guidelines that may be required to create subject headings in a cooperative mode.

TASK II

> The difficulties in defining and coding headings that may or may not conform with the guidelines established for Library of Congress Subject Headings should be analyzed for their implications for decentralized input to a network authority file where consistency must be maintained. General guidelines should be developed for creating and applying Library of Congress subject headings in a network context. Existing capabilities for identifying Library of Congress subject headings and other system headings should be evaluated and extended, if necessary, in the MARC authorities format and in MARC bibliographic records.

The results of the agreements between the Library of Congress and the National Library of Canada concerning Library of Congress subject headings will provide considerable input for this task. In addition, a pilot project should be conducted by the Library of Congress to determine the difficulties in coding and defining subject headings created by other institutions. The pilot project should consider permitting flexibility in decisions concerning headings and coding in order to avoid massive updates of existing files.

Publications for Which Headings Are First Established

The characteristics of the publication that cause a heading to be established can influence the name form that becomes the established form. To illustrate, for names in nonroman alphabets, Anglo-American Cataloging Rules provides the option of systematic romanization (converting the name heading according to a transcription table) or conventional romanization

[illegible] the established form of the name that appears on the established records). Thus, the choice of the established form of name would be determined by whether the item being cataloged is the original publication or a translation of the original.

Reference sources available when headings are established

The quality and quantity of reference sources available to the individual participants will vary. It may be necessary to develop a reference tool list that would be an appropriate common denominator for the network. Alternatively, centers of excellence or responsibility might concentrate on the validation of data for publications in specified subject areas for which only particular reference sources would be consulted.

Recording file of established headings

The headings that are included in the network authority file will be determined by the bibliographic records that are contributed to the network union catalog. Thus, definitions of the content and scope of this union catalog are essential to the establishment of the content and scope of the network authority file. In this respect, policy being considered by the Library of Congress may be influential:

> When the automated system has proven to meet the Library's needs, new cards will no longer be added to the file and official headings [illegible]. It is planned that the manual catalogs will be published in book or microform after access to filing arrangements have been established. Meanwhile, the MARC data bases will be considered to be complete for cataloging purposes and new entries will be retrieved only in the computerized.
>
> By inserting the MARC data bases as self-contained, the Library will be free to undertake many desirable projects to enhance the quality of the catalog, among which are conversion of older name headings that are inconsistent with the current rules, more rigorous implementation of subject headings, etc.[6]

It is not yet possible to say whether individual bibliographic utilities will wish to use the network union catalog as the file against which all new headings in their authority catalogs will be established. Predictable fee file update and heading retention will have to be weighed by network participants in choosing whether to use the network authority file as the institution-specific authority file or to maintain a separate institution-specific authority file. The latter

required to differentiate certain common names will depend to a certain extent on the size of the file into which the new heading is to be incorporated without conflict with forms established earlier.

Individuals Who Interpret the Rules

To develop a network authority file cooperatively, it is likely that some minimum standard of cataloging training would need to be part of the system operational requirements. A set of cataloging manuals to promote uniform interpretation of the network cataloging rules would appear to be an essential tool. The writing of the manual and training would need to be carried out by the appropriate agencies.

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VII. DESIGN CONSIDERATIONS FOR THE NATIONAL LIBRARY NETWORK AUTHORITY FILE

Relationship between Bibliographic and Authority Records

In a paper presented to the Working Party on National Bibliographic Name Authority Files, Rather observed that:

> Established headings must by definition be distinctive, but it does not follow that they are self-identifying. Uncertainty in relating the form of a personal name found on a title page to the established form is fairly common. Thus, personal name authority records generally have to be used in conjunction with the bibliographic records to which they apply.
>
> This kind of ambiguity is rare among corporate headings and is virtually unknown among uniform title headings and so it is seldom mandatory to examine the bibliographic records. Nevertheless, relationships shown by see-also references must often be clarified by history notes, and dates, places, and meeting numbers must be included in the authority record for a meeting because the established form consists only of the basic name.(1)

The concept of "self-identifying" may also be applied to series and subject headings. Series headings could probably be differentiated from other series without references to the bibliographic items in the respective series. Occasionally, however, the scope of a given subject heading could be made more explicit if it were associated with the bibliographic item to which it has been applied.

The significance of the concept of self-identifying headings for authority file products is that a list of personal names disassociated from the bibliographic records that carry those names may be of limited value for some purposes. It may thus be worthwhile to investigate whether bibliographic records in the network union catalog could provide an acceptable substitute for a personal name authority service.

TASK 12

> Determine under what conditions personal name authority records are necessary for network use and under what conditions the authoritative form of a personal name can be provided more effectively as a heading associated with a bibliographic record.

Survey results from Task 2 concerning the use of authority services can be used for this task. Since Library of Congress MARC bibliographic records do not contain any cross-reference information, inquiries should be made of the national libraries of Australia, Canada, and Great Britain concerning available surveys on the uses that are made of cross-reference data in their respective MARC record services.

An examination of the Washington State Library statistics concerning the frequency of use of personal name headings in the Library of Congress MARC bibliographic records should be undertaken, and the implications of two possible file organization approaches--headings maintained separately from the bibliographic record and headings maintained as an integral part of the bibliographic record--should be determined. The experiences of the Washington Library Network and the New York Public Library in this area should be drawn upon.

Currency and File Update

The network authority system should consist of five major subsets: personal names, corporate names (including conferences), uniform titles, series, and subjects (topical and geographic). As was discussed in Section II, name headings in an authority file serve as a source for already established headings, as a source of information regarding related references of established headings, and as a benchmark for establishing new headings that are compatible with the existing file. A subset need not be entirely up-to-date to be useful for the first two uses when the heading sought is in the file. An incomplete authority file for any of the above subsets, however, would not be adequate for establishing a new heading or for the above when the heading sought is contained in the missing part of the file. Thus while the network authority file ideally should serve all three functions, an up-to-date file does not necessarily need to be available to the network participants for it to provide a useful authorities service. The significance of currency will probably be different for each subset of the authority file because some subsets will grow more rapidly or be revised more frequently. The data gathered in Task 18, an investigation into the growth rate of subsets of authority files, should be analyzed for trade-offs with respect to currency.

Establishment of a new heading in the context of a national library network authority file will require a file that is current and complete. Since the network authority file will not be current and complete to all participants until all cataloging is conducted on-line to the national system, strategies must be developed to synchronize the updating of network and local files. Headings that create conflicts with

others established earlier will have to be revised and the revision strategies will be conditioned by the medium, that is, on-line, magnetic tape, microform, or hard copy, and the timeliness of the service through which they are distributed.

TASK 13

> Determine the extent and nature of activities that must be undertaken by centers of responsibility to maintain a current authority file for a library network and the type of information and file update strategies that are required by bibliographic utilities to enable them to synchronize their authority and bibliographic files with the national library network union catalog. Strategies, procedures, and facilities should be developed to permit records emanating from disparate input sources to be added to a consistent machine-readable national library network union catalog.

Tasks already described will provide some of the raw data that should be studied further to deduce the type of information and the file update strategies that are required to synchronize local and network authority and bibliographic files. Task 2 will provide information on the use of the authority file. Tasks 10, 11, and 12 should provide useful data on the type of control information that might be required to perform the actual updates. Task 5 will supply much of the needed information on the nature of the network itself and the functions to be performed by the respective participants.

Access to the Network Authority Files

Ideally, whether the network authority files are centralized or distributed, well-defined systems or standards should be used for creating the headings, and the standards selected should be clearly identified in the records.

Access points could consist of entire headings or abbreviated search keys. If the files are distributed, software protocols must be carefully formulated and followed. Otherwise, the network users will require a variety of manuals, have to be conversant with a number of search strategies, and need to reformulate search requests each time a node in the network using a nonstandard form of indexing is accessed. The implications of employing different types of indexes to access authority files in a network need to be studied to determine the most efficient method of supporting a variety of access strategies.

TASK 14

The implications of employing various types of indexes to access authority files in the national library network should be investigated and the most effective method capable of supporting a variety of access strategies should be recommended for network use.

Indexes being used in operational and planned authority systems should be examined and their adequacy to support network access determined. A detailed report on the indexes required for the network authority file system should be prepared and circulated to individuals responsible for the access design in each of the institutions with planned or operating systems. Field visits to selected institutions should be undertaken to ensure that important requirements have not been overlooked and that there is a consensus on the indexes that are required to support effective and efficient access to the network authority facilities as well as to the bibliographic and location files.

Access Support Mechanism

An authority file is meant to be scanned, since the user frequently approaches this file with imprecise information. Software that enables the user to gain access to a point in the file most likely to yield a successful response to a query, permits scanning of a file in both a "forward and backward" direction, and uses truncated search arguments appears to be highly desirable.

Automated systems using abbreviated search keys as a search argument and requiring an exact match to the argument may result in a large number of records. Some systems reduce the number of responses through the use of qualifiers. Others, however, abort a search if the inquiry produces an excessive number of records and the user is forced to use another search argument. A more significant problem may be that there may be no useful relationship between the entities retrieved and the search request. Therefore, the ability to gain access to a potentially successful point in the index should provide better service to the authority system user.

TASK 15

An effective technique in terms of user protocol and access strategies that can support query of the national library authority file indexes using imprecise search arguments should be developed.

The access techniques of the computer-to-computer connection between the Research Libraries Group and the Library of Congress should be analyzed in terms of their implications for network telecommunications. Recommendations of the NCLIS/National Bureau of Standards Task Force on Computer Network Protocols at the application level and the results of the Network Technical Architecture Group (NTAG) message text study should also be examined.

Central versus Distributed Data Base

A design aspect open to question is whether the entire network data base (bibliographic, authority, location) will be made up of the sum of all the individual data bases, or whether it will be necessary to have a master copy of the entire data base at a central node or at several nodes. This aspect of the design becomes significant when certain facets of the system, such as printing (hard copy or microform) the National Union Catalog or the national authority file or maintaining the data base, are considered.

To design an optimum system, storage versus communication costs will need to be analyzed. An investigation of these trade-offs is part of Task 6. To assist in such a study, there must be realistic estimates of traffic loads for the network.

TASK 16

> An estimate of traffic loads, that is, the number of on-line queries, the number of terminal and computer messages, and the storage requirements, for various design alternatives must be determined to assist in the development of an efficient data base system design.

The background data gathered in Tasks 1, 2, 7, 8, 10, 11, 12, and 18 should be assembled and correlated with information on the network configuration derived in Tasks 3, 4, 5, 6, 13, and 16 to produce an estimate of the network traffic load. These figures would have to be adjusted as the detailed specifications concerning network indexes, access techniques, and quality control mechanisms are agreed on as proposed in Tasks 14, 15, 17, and 19. The network model developed as part of Task 5 should be adjusted as necessary to simulate network performance.

Quality Control

In an on-line environment the complete up-to-date authority file should be available, enabling the user to make immediate decisions concerning the uniqueness of the authority

data. Experience gained at New York Public Library in mechanically verifying that a heading has been established raises the question whether this type of quality control should depend on human interrogation of an on-line file or should be a machine function. The New York Public Library authority validation is restricted to a mechanical determination that a heading is valid or that a cross-reference is not used as a heading. It cannot check that the heading selected is appropriate. The New York Public Library authority system demonstrates, however, that at least the validation and cross-referencing functions of an authority file can be a machine-based operation. If bibliographic utilities and centers of responsibility develop similar capabilities, two technical processing functions of an authority system could become machine-based, thereby freeing a considerable amount of human effort to the third function of establishing new headings and resolving conflicts.

TASK 17

> The authority file quality control mechanisms developed and tested at New York Public Library should be examined for their applicability of replication throughout the national library network as a means of enhancing the efficient operation of the national library network data base.

New York Public Library catalogers often do not consult the subject authority file to determine whether a particular Library of Congress subject heading has been established by their library. This task is relegated to the quality checks performed by computer programs. This function became machine-based after the New York Public Library subject authority file reached a certain size. It may be significant that preliminary analysis at the New York Public Library indicates that the rate of growth of subject and name authority files is fairly independent of collection size and that the rate of growth tapers off after a certain point.

TASK 18

> The rate of growth of subsets of the national library network authority file relative to the number of bibliographic records in the national library network union catalog should be analyzed and the implications for mechanical quality control and record distribution determined.

The Library of Congress MARC data base of existing records should be divided into segments based on the year in which each record was created. Using automated techniques, the headings in

the MARC records comprising each annual segment would be compared against a cumulating file of headings created from MARC records for earlier years. Each authority file subset, that is, personal name, corporate name, conference name, uniform title, and subject heading, would be analyzed for the rate of growth and record distribution implications.

The basic software for analysis of file growth may exist in institutions that have developed automated authority systems. Washington Library Network and New York Public Library, for example, may be able to perform the requisite type of analysis. Locally produced MARC records might also be subjected to a similar process and compared to the growth rate for the Library of Congress headings. Studies made by the former Library of Congress Technical Processes Research Office should be analyzed to determine how much of this information already exists.

Off-line Access Considerations

A magnetic tape service emanating from the network union catalog and similar to the announced Library of Congress MARC authorities distribution service might be provided for the national library network. Likewise, a system can be conceptualized whereby 1) headings are submitted by network participants to the network authority file via magnetic tape, and the file is maintained by a central node and 2) requests for authorities are submitted by network participants to a central node and the responses to such requests distributed via magnetic tape. In both instances, the system is assumed to be a batch system.

The theoretical limitations imposed by such an off-line system are significant and should be documented to provide a contrast with counterpart considerations inherent in on-line access.

TASK 19

Determine the implications for access and quality control inherent in off-line access to the national library network authority file.

REFERENCE

1. John Carson Rather, "Thoughts about a National Name Authority File," working paper presented to the Working Party on Bibliographic Name Authority Files, 1976.

VIII. THE LIBRARY OF CONGRESS AND NATIONAL LIBRARY NETWORK COORDINATING RESPONSIBILITIES

An information brochure prepared by the Library of Congress in 1977 provides an overview of the functions and organization of the Processing Department. Some of the major responsibilities described include:

> "Cataloging, Classification, and Preparation of Materials for Use. Developing and maintaining rules of cataloging, subject headings, and the Library of Congress and Dewey Decimal schemes of classification; cataloging, classifying and otherwise preparing the publications which are acquired for use by the Congress, federal agencies, and the general public.
>
> "Bibliographic Control. Providing information on materials in process or previously cataloged by maintaining and searching the Process Information File and the Serial Record, general public card catalogs, the Official Catalog, specialized card catalogs, and the MARC data base.
>
> "Production and Distribution of Cataloging Information. Producing and distributing through the self-supporting Cataloging Distribution Service cataloging data in the form of MARC tapes, proofsheets, technical publications, the book catalogs which contribute to the American national bibliography, and printed catalog cards to subscribers.
>
> "Automation of Bibliographic Control. Developing and implementing systems for creating and using cataloging data in machine-readable form for the Library and its community of users; contributing to the development of a computerized national bibliographic network through formulation of standards, distribution of name and subject authority data, and management of cooperative projects intended to build a national data base in machine-readable form.
>
> "Research in Technical Processes. Conducting research in cataloging, classification, subject analysis of library documentary materials, and related technical processes." (1)

It is clear from this statement that the Library of Congress is already performing a number of national library tasks deemed appropriate by the Network Advisory Group for such a

center. Figures 2 and 3 illustrate the existing Library of Congress automated system and the modules that will become operational between 1977-1980.(2)

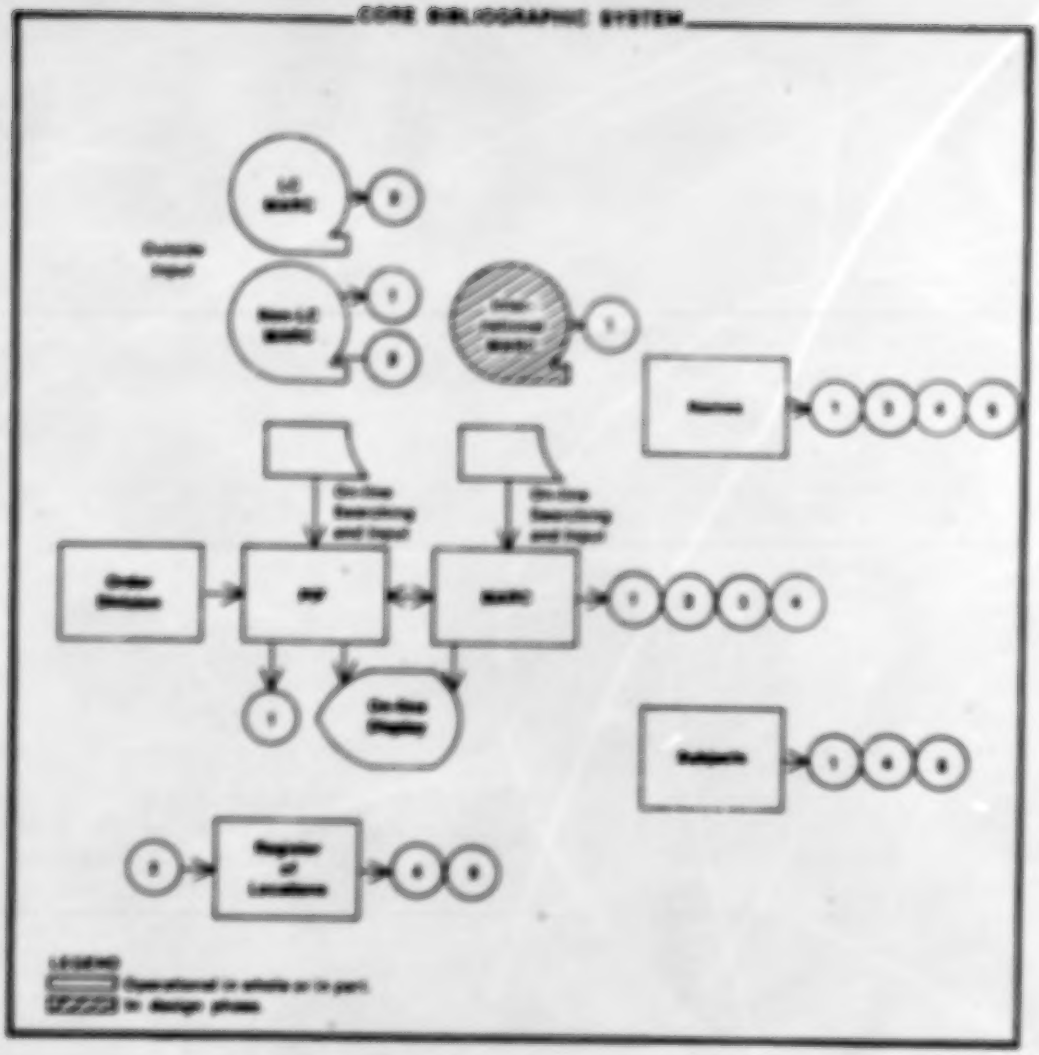
Since the planning of these services and systems predates the concept of a formal nationwide library network, it appears that the role of the Library of Congress in the future network and its ability to perform that role will be compromised if these services and systems do not harmonize with the library services and systems envisioned by potential participants in the emerging national library network. Two investigations, referred to as the Buckland study (3) and the Research Libraries Group/Library of Congress (*RLG/LC*) experiment (4), are currently being conducted for and with the Library of Congress to ensure the identification and development of the appropriate bibliographic building blocks for the emerging national library system. The Buckland study was designed to produce among other things: a) a statement of the role of the Library of Congress in the evolving national information program over the next five to seven years, showing in priority order the steps that it will need to take to fulfill that role, b) a summary of the status and plans of major U.S. library and network systems including their basic characteristics and network experiences to date, c) based on the above, a statement of what appears to be the major missing components requiring implementation to assure progress in network development.

Phase one of the *RLG/LC* experiment will consider the possibility that a single Library of Congress MARC file can be maintained at the Library of Congress with each of the regional systems keeping only the portions that they actually need. The Research Libraries Group and the Library of Congress will evaluate the effectiveness and feasibility of accessing the Library of Congress MARC master file on-line to build the Research Libraries Group machine-readable data base. The Research Libraries Group will use the computer at the New York Public Library to request records from the Library of Congress MARC file, and the desired record will be transmitted directly from the Library of Congress computer to the New York Public Library computer.

William J. Welsh, The Deputy Librarian of Congress, in a recent presentation to the IFLA General Council entitled "The Future of the Catalog," stated that:

> By 1980, the Library plans to have all of its current cataloging in MARC form. In addition, it is anticipated that all the authority structure for the names and subjects used in the bibliographic records in machine-readable form will also be in the data

Figure 3


CORE BIBLIOGRAPHIC SYSTEM

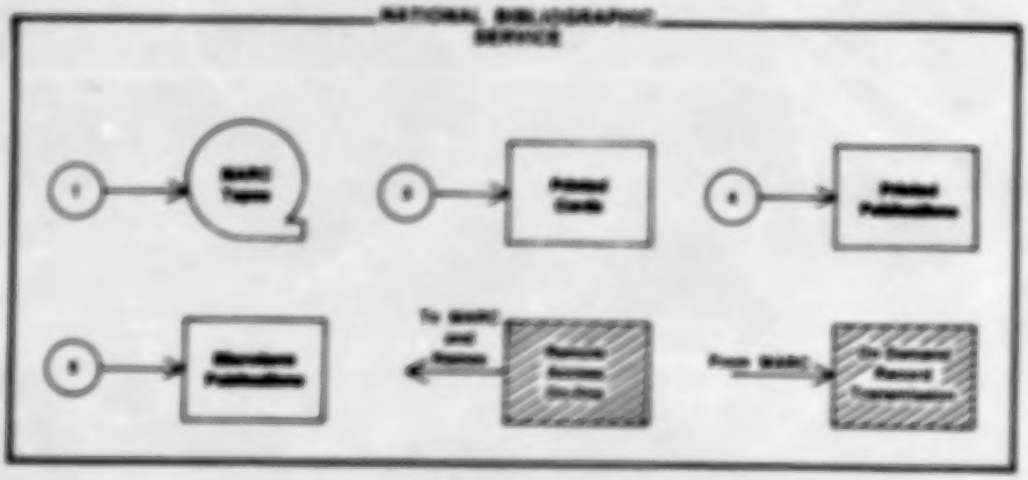
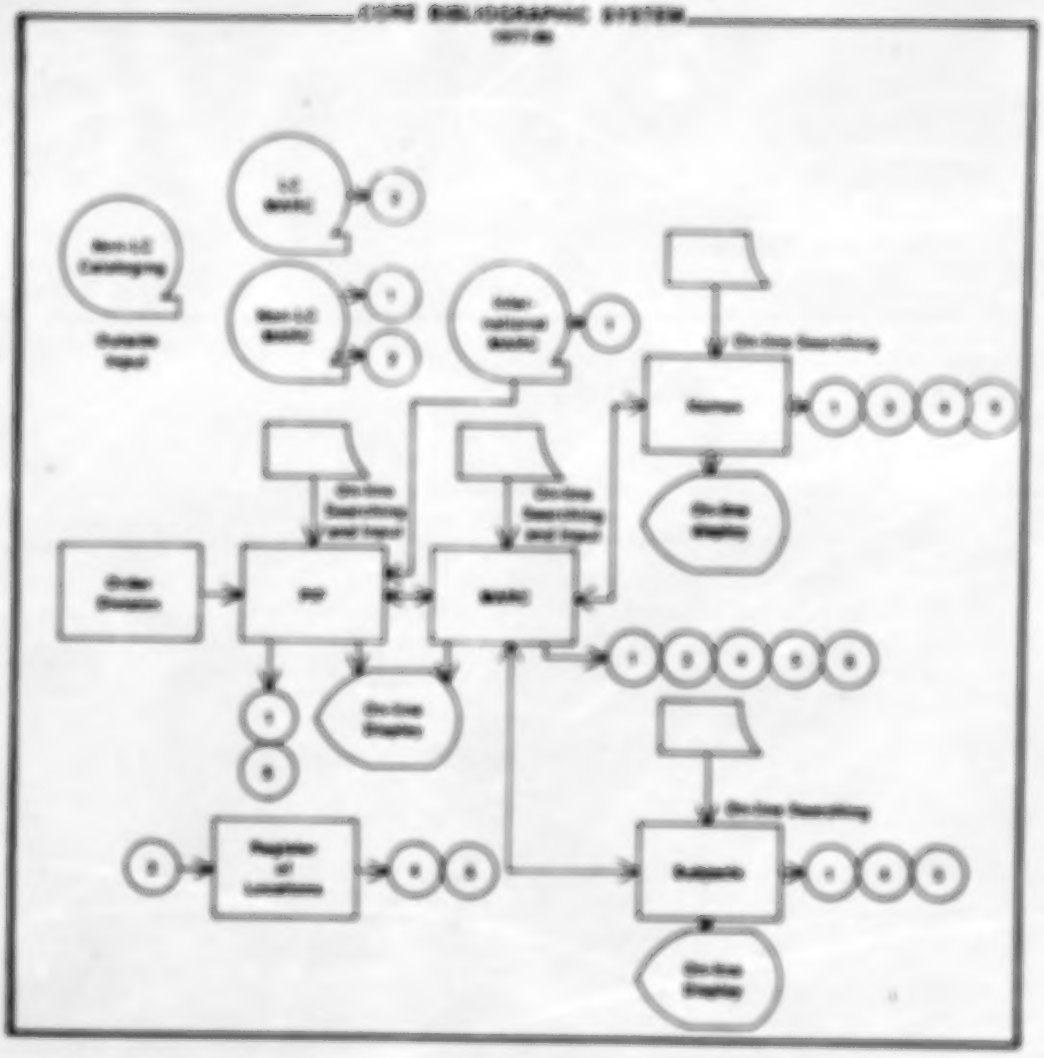
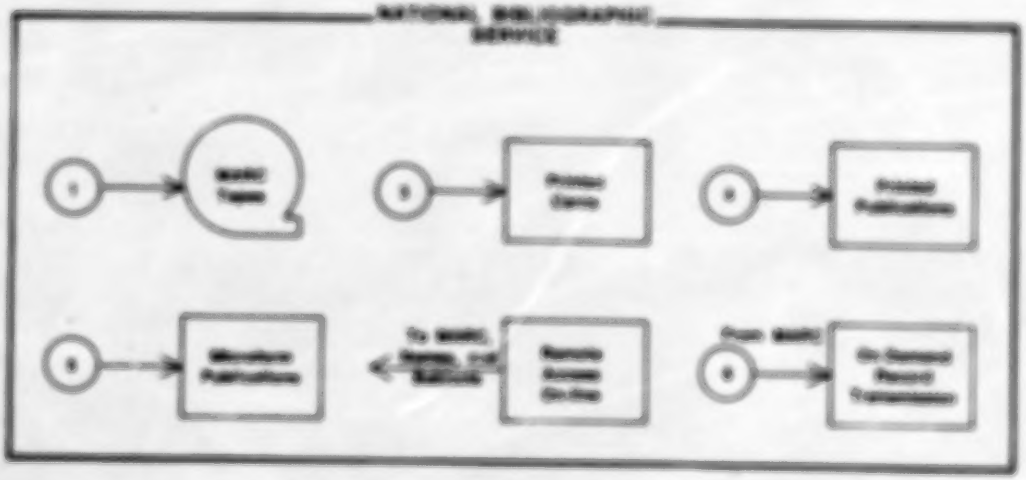

NATIONAL BIBLIOGRAPHIC SERVICE

Figure 3





base. This system will provide the capability of performing the cataloging process on the terminal; in essence, then, the file becomes an on-line catalog with all of the inter- and intra- related structures.(5)

The Library of Congress authority file and system must meet the requirements of the "catalog of the future," a catalog that will have to fulfill the needs of an emerging national library network. These requirements can be better provided for if representatives from the agencies likely to participate in the emerging national library network make available to the Library of Congress their individual requirements and plans and reasonable estimates of the types and volumes of transactions each expects to impose on the network. There must be some understanding in the Network Advisory Group on sharing responsibilities, but the initial group of participants must be identified before detailed design of the automated national authority file system can begin. The process of network definition and authority system design must be an iterative one, that is, the system capabilities should be refined as the national library network requirements become clearer, and the network requirements adjusted as the authority file system is made more explicit.

It is essential that the Network Development Office of the Library of Congress coordinate the definition of stated requirements and configuration of the national library network with the design specifications of the national library network authority file to ensure that the authority system will meet the evolving requirements of the network.

REFERENCES

1. United States, Library of Congress, Processing Department, Processing Department of the Library of Congress (Washington, D.C.: Library of Congress, 1977), p. 5.

2. Ibid., pp. 9-10.

3. The Role of the Library of Congress in the Evolving National Network, a study commissioned by the Library of Congress Network Development Office and funded by the National Commission on Libraries and Information Science, prepared under contract by Lawrence F. Buckland and William S. Dancheck, Inforonics, Inc. (Washington, D.C.: Library of Congress, 1978).

8. [illegible], [illegible], "[illegible]," [illegible], [illegible], [illegible] [illegible], [illegible], [illegible] [illegible], [illegible], [illegible]

LIST OF TASKS

TASK 1

A study should be made to determine the number of discrete library rules and standards in use in libraries in the United States and the extent to which these rules and standards have to be accommodated in the national library network authority file(s) and system(s).

TASK 2

A study should be made to determine the use of authority files by individual institutions and the sources from which these files are derived. In particular, the study should determine the uses that individual libraries make of Name Headings with References and of Library of Congress Subject Headings, in its various formats, and the strengths and weaknesses of each service and its format(s). The use of the National Union Catalog and the Subject Catalog as a source of authority information should also be determined.

TASK 3

The tasks ascribed by the Network Advisory Group to a network coordinating agency, namely, 1) design the technical network configuration, 2) determine the legal and organizational structure of the library bibliographic component, and 3) specify the configuration of the national data base(s), should be analyzed for their implications for the design of the national library network authority file.

TASK 4

A study should be made of the methods by which the national library network could provide access to the records that comprise the national library network data store and of methods for selecting records from the data store to be upgraded to network data base status. The categories of headings in records in this file that might usefully be incorporated into the

national library network authority file should be determined. The economics of building the indexes to access the data store and of transferring records from the data store to the network data base should be considered.

TASK 5

The quadraplanar data structure, developed at the University of Chicago and implemented by the Washington Library Network, should be carefully evaluated as a data base design model for a centralized or a distributed national library network data base.

TASK 6

Determine the trade-offs in communications costs, storage costs, accessibility to data, software and hardware requirements, etc., implied by a distributed data base design versus a centralized data base design for the national library network union catalog.

TASK 7

A study should be made of the efforts currently being exerted to integrate reports into the National Union Catalog to determine how these can be facilitated by an automated authority control system. The number of reports currently contributed should be used to project the number of potential reports to the national library network union catalog.

TASK 8

Determine the consequences from the lack of both bibliographic records and location data of representing only prospective cataloging in the national library network union catalog, and assess the effect that such a policy might have on the national library network data base design and on plans for retrospective conversion of existing library catalogs.

TASK 9

Further work must be undertaken by the Library of Congress to accommodate series in either the bibliographic format or the authorities format.

TASK 10

Differences in the application, interpretation, etc., of AACR 2 should be analyzed to determine which problems can be eliminated by common agreements on rule interpretation, uniform choice of AACR 2 rule options, and authority file and system override of variant headings. The results of this analysis should be used in the design of the national library network data base.

TASK 11

The difficulties in defining and coding headings that may or may not conform with the guidelines established for Library of Congress Subject Headings should be analyzed for their implications for decentralized input to a network authority file where consistency must be maintained. General guidelines should be developed for creating and applying Library of Congress subject headings in a network context. Existing capabilities for identifying Library of Congress subject headings and other system headings should be evaluated and extended, if necessary, in the MARC authorities format and in MARC bibliographic records.

TASK 12

Determine under what conditions personal name authority records are necessary for network use and under what conditions the authoritative form of a personal name can be provided more effectively as a heading associated with a bibliographic record.

TASK 13

Determine the extent and nature of activities that must be undertaken by centers of responsibility to maintain a current authority file for a library

network and the type of information and file update strategies that are required by bibliographic utilities to enable them to synchronize their authority and bibliographic files with the national library network union catalog. Strategies, procedures, and facilities should be developed to permit records emanating from disparate input sources to be added to a consistent machine-readable national library network union catalog.

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TASK 19

Determine the implications for access and quality control inherent in off-line access to the national library network authority file.

ABBREVIATIONS

AACR	Anglo-American Cataloging Rules (1967)
AACR 2	Anglo-American Cataloguing Rules, 2d ed. (forthcoming)
CIP	Cataloging in Publication
COMARC	Cooperative MARC
IFLA	International Federation of Library Associations and Institutions
LC	Library of Congress
LC MARC	MARC records created by the Library of Congress
LCSH	Library of Congress Subject Headings
MARC	Machine-readable cataloging
MESH	Medical Subject Headings
NCLIS	National Commission on Libraries and Information Science
NELINET	New England Library Information Network
RLG	Research Libraries Group
SOLINET	Southeastern Library Network

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UNIMARC, Universal MARC Format, recommended by the IFLA Working Group on Content Designators (London: IFLA International Office for UBC, 1977).